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**Plastics ski binding - having a sole plate to which are attached a heel cup and toe retainer**

A ski binding (10) comprises an elongated resilient plastics sole plate (12) to the rear end of which is attached a plastics heel cup (14) having a curved rear wall (43), spaced side walls (42), and a receiver for a first securing strap (56). Attached to the front end of the plate is a toe retainer (20) of U-shaped cross-section, the base of which is connected to the plate and the free ends of the arms of which are provided with slots to receive a second securing strap (21). The binding is connected to the underlying ski only at its front end.

**ADVANTAGES**

The binding provides the correct degree of flexibility.

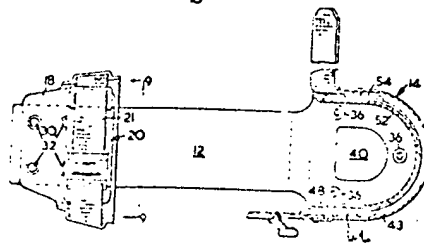
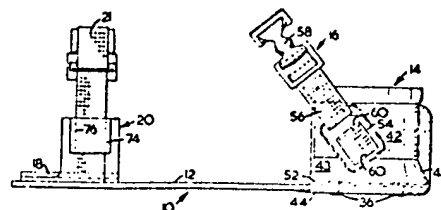
**DETAILS**

The components of the binding are pref. moulded from polyethylene or nylon. The heel cup is connected to the sole plate by rivets (36) which pass through a flange at the base of the cup. The base of the toe retainer is overlaid by a toe plate (18) and the retainer and plate are secured to the

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sole plate by screws (32) which also act to secure the sole plate and thus the binding to the ski. (16 pp.).

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**CANADIAN PATENT**

⑭

**SKI BINDING WITH RESILIENT SOLE PLATE USED WITH  
OVERBOOTS, MUKLUKS ETC.**

⑮

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Canada****Granted to Her Majesty in right of Canada, as represented  
by the Minister of National Defence, Canada**

⑯

**APPLICATION No. 185,956  
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⑰

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**PRIORITY DATE****No. OF CLAIMS 10**

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SKI BINDING

This invention relates to a ski binding. More particularly, the invention relates to a ski binding suitable for use with mukluks, shoes, overboots, and such footwear other than conventional ski boots.

BACKGROUND OF THE INVENTION

Skiing can be categorized as including down-hill, racing, cross-country and leisure time activities. Each of these activities tends to require its own type of ski, bindings, and boots. Down-hill and racing forms of skiing, for example, demand maximum control of the skis and body movements. Thus, the bindings and boots used in that type of skiing must meet high standards of quality and stringent requirements to insure rigidity and unison of movement of the skier and skis.

By contrast, cross-country or trail skiing are more leisurely activities wherein rigidity between ski bindings and a skier's foot is not so critical. Indeed, it is necessary for the bindings used in trail skiing to allow substantial flexure of the foot when traversing across fields or along trails. In this mode of skiing the foot must flex relatively freely in the same manner as it does during walking. In addition to this primary requirement, however, cross-country or trail skiing does occasionally involve skiing up and/or down hills. Most skiing movements on hills require a certain degree of lateral stability to maintain a desired line of movement and control.

Cross-country and trail skiing takes in participants in both civilian and military roles. The former skis for fun and exercise; while military personnel may also ski on maneuvers and training in Northern regions, in addition to recreational skiing. It is a problem from the military standpoint to be able to accommodate skiers without the need to

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provide special footwear, i.e., ski boots, above and beyond the normal footwear issued to military personnel. This factor tends to render most prior art ski bindings unsuitable, even those normally associated with trail skiing.

SUMMARY OF THE INVENTION

The present ski binding will overcome a number of problems inherent with prior art ski bindings. The bindings herein are easily attachable to a pair of skis. They provide a good deal of pivotal flexibility for movement about an axis  
10 extending transversely at right angles to a ski, and parallel to a plane in which the ski is disposed. Simultaneously therewith, the present ski binding inhibits side-slip and excessive looseness for movement in directions laterally of the ski. Accordingly, the present ski binding incorporates a beneficial mix of selected features for casual down-hill skiing along with features needed for conventional trail or cross-country skiing.

The present invention thus provides an elongated resilient sole plate having an upper and lower major surface, a forward portion and a rear portion, said forward portion only  
20 having means for connecting same to a ski; a heel engaging cup attached to said sole plate at the rear portion thereof, said cup having spaced side walls and a rear wall for supporting the rear portion of the footwear of the skier, the heel engaging cup including strap receiving means for securing the heel cup to a skier's foot; a toe retainer assembly attachable to the forward portion of the sole plate, the toe retainer assembly including a spaced apart pair of upright arms for embracing the toe portion of the footwear and being provided with apertures extending  
30 therethrough for receiving a toe strap means through said apertures to grip the toe portion of the footwear being worn by the skier; and wherein said sole plate is sufficiently resilient as to enable

the same to be flexed and the heel engaging cup to be swung upwardly and downwardly relative to said forward portion in an imaginary plane parallel to the longitudinal axis of the sole plate and normal to the major surfaces of the sole plate, said sole plate further providing for substantial rigidity of the heel engaging cup in a plane at right angles to the first mentioned imaginary plane to inhibit side-slip of said cup in a plane parallel to an upper surface of a ski when the binding is attached thereto.

10                   In a further aspect the toe retainer assembly is generally U-shaped, each of said two arms having bosses formed thereon with apertures extending through said bosses for receiving said toe strap.

                  In a further aspect said toe retainer assembly includes a transversely extending slot in a ski engaging surface thereof, said slot being configured to receive the toe strap means thereby to secure the toe portion of a skier's footwear firmly to said ski.

20                   In a further aspect lower portions of the side walls of the heel engaging cup are inclined outwardly to form a cross-sectionally enlarged bottom zone to receive the enlarged heel zone of the footwear.

                  In a further aspect said sole plate comprises a single generally flat strip of synthetic plastics material.

                  In the preferred embodiment of the present ski binding apparatus, at least one and preferably each of the toe retainer, the heel engaging means and the sole plate are molded from nylon 11 or other such polymeric material having similar properties of strength and resiliency.

30                   The present ski binding apparatus is easy to install on a pair of skis. Moreover, applicant's ski binding as described herein is adaptable for use with different types of footwear other than conventional ski boots.

These and other features and advantages of this invention will become apparent from the detailed description below. That description should now be read in conjunction with the accompanying drawings.

IN THE DRAWINGS

The drawings herein illustrate by way of example only, a preferred embodiment of this invention which is not intended to be limited thereto. Thus, in the drawings:

FIGURE 1 is a side elevation view of one ski binding embodied by this invention;

FIGURE 2 is a plan view of the ski binding of FIGURE 1;

FIGURES 3, 4 and 5 are plan, end and side elevational views respectively, of a heel cup used in the ski binding of FIGURES 1 and 2;

FIGURES 6, 7, 8 and 9, are a fragmentary view, a top plan, front elevation and assembled views of a toe plate and retainer assembly for the ski binding of FIGURES 1 and 2; and

FIGURES 10 and 11 are an exploded view and assembly view, both taken in perspective, of the present ski binding apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A ski binding of the kind envisaged herein is shown overall at 10 in the drawings. The binding 10 includes a sole plate 12, a heel cup 14 which is secured to the latter, heel strap means 16, a toe plate 18, toe retainer assembly 20 and strap means 21 which are also attachable to the sole plate 12. These parts will be described more fully below.

It is appropriate to emphasize here that the present ski binding 10 is provided with right and left foot forms thereof. Accordingly, a pair of ski binding apparatus 10 has one left and one right foot binding assembly used in cooperating

pairs. Each ski binding of the pair is basically a mirror image of the other, as taken about a plane extending longitudinally between, and parallel to the skis.

The following description, therefore is for one ski binding apparatus of such a pair. It is to be understood that a matching or twin ski binding for cooperative use therewith will have the same structural features, but as a mirror image of the other, as mentioned earlier.

To return to FIGURES 1 and 2, the sole plate 12 has a  
 10 forward or toe portion thereof provided with a plurality of apertures 30. These apertures 30 are positioned so as to be capable of alignment with a corresponding plurality of apertures 32, 32' formed in the toe retainer 20 and toe plate 18. The apertures 32 and 32' are best seen in FIGURES 2, 7 and 10. Fastening means in the form of threaded screws 34, or other such fasteners are provided extending through the apertures 30, 32 and 32'. The screw 34 acts as common fastening means for the sole plate 12, the toe plate 18 and toe retainer assembly 20, and is intended to be embedded in the body of a ski  
 20 approximately centrally thereof. See Figs. 10 and 11. The exact location at which the sole and toe plates 12 and 18 and toe retainer 20 are secured to a ski will be evident to those knowledgeable in this art. The toe plate 18 is made preferably of aluminum, or other metal in order to minimize wear by contact with the footwear of a user.

The forward and central portions of the sole plate 12 have a width roughly equal to that of the ski with which it is intended to be used. A rear or heel portion of the sole plate 12 is somewhat larger, and has a width which exceeds  
 30 that of the ski. The rear or heel portion of the sole plate 12 is provided with a plurality of apertures. A corresponding plurality of rivets 36 or other such fasteners extend through these apertures and secure the sole plate 12 and heel cup 14



firmly together. It is to be noted that the heel cup 14 and rear portion of the sole plate 12 are themselves unattached to the ski. The sole plate 12 is thus attached to a ski only by the threaded screws 34. Such an arrangement affords considerable freedom for flexure or pivoting of the rear or heel portion of the ski binding 10 about an axis extending transversely of the sole plate 12 and disposed generally in the plane of the forward portion of that sole plate. The sole plate 12 is made preferably of nylon 11 or of some other polymeric material

10 having similar properties of strength and resiliency. The strength properties of the sole plate 12 coupled with the width thereof, give substantial lateral rigidity to the ski binding 10. This is effective to inhibit unwanted looseness or side-slip of the ski binding 10 in a plane parallel to that of the ski to which that binding is connected.

As seen from Figures 1 and 3-6, the heel cup 14 comprises a heel-receiving cavity or opening 40. The cavity or opening 40 is defined by substantially planar and spaced apart side walls 42, an arcuate rear wall 43 and a bottom flange 44.

20 The heel cup 14 is preferably molded and in the form that walls 42, 43 and flange 44 are joined together integrally. These walls 42 and 43 thus define front and top openings through which access is provided to the heel-receiving cavity 40.

Each of the side walls 42 includes an inclined lower portion 46 which is connected along one edge thereof to the bottom flange 44 and along another edge opposite thereto to a straight upper wall portion 48. The inclined lower wall portion 46 is at an angle, preferably of about 60 degrees to the plane of bottom wall 44. The upper wall portions 48, on the other hand,

30 preferably are more or less perpendicular to the plane of the bottom flange 44, or alternatively, slightly less than that so as to be biased inwardly of the heel-receiving opening 40.

In view of the inclined lower wall portions 46, there is a cross-sectionally enlarged bottom zone 50 which is formed. This bottom zone 50 is of a height of approximately 1 to 1.5 inches from the plane of the bottom flange 44. This enlarged bottom zone 50 is configured to receive the heel portion of a mukluk, overboot or other such footwear with which the ski binding 10 is being used. Thus although the inclined and perpendicular wall portions 46 and 48 have the preferred form mentioned earlier, the angular relationship of these wall portions to the plane of the bottom can vary. The angular relationship of these wall portions 46 and 48 relative to the plane of the bottom will be based selectively on the exact configuration of the heel portion of footwear thought most commonly to be used with the ski binding 10.

For use by military personnel, for example, standardized footwear is issued to most personnel. This footwear, frequently is in the form of mukluks and, will be of a predetermined shape although sizes can vary. The exact form and construction of mukluks and other such footwear is not itself part of this invention. The heel cup 14 and enlarged bottom zone 50 will naturally vary in size correspondingly. Small, medium and large sizes of heel cups 14, for example, can be provided. By virtue of the inherent resiliency of the material of which the heel cups 14 are made, such heel cups will accommodate, say, two or three different sizes of footwear.

The enlarged bottom zone 50 is provided with an inwardly directed retainer flange 52 which is best seen in Figures 3 and 4. This retainer flange 52 preferably extends continuously with the straight and arcuate side walls 42 and 43, although flange segments could also be used. Either way, the retaining flange 52 is spaced from the bottom flange 44 by a distance which is adapted closely to receive the heel

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portion of the sole plate 12. See Figs. 1 and 10.

The spaced apart side walls 42 are each formed with a strap retaining buckle or clip 54, best seen in Figures 1 and 3-5. The heel strap means 16 includes a strap portion 56 and a clasp or buckle 58. The heel strap means 16 is made preferably of treated woven material such as cotton duck fabric; although nylon 11 or other similar polymeric material could also be used. It is seen from Figure 1 that the strap portion 56 is intended to be threaded through slots or apertures 60 which are provided in the buckle 54. It is preferable that the buckle 54 be molded integrally with the side walls 42. The buckle 54 normally is disposed at an incline of between 45 and 60 degrees to the plane of the bottom flange 44. This angle of inclination is for convenience primarily so as to minimize any torque which might otherwise be generated by the heel strap means 16 on the buckle 54, and the connection thereof to the side wall 42.

The structure of the toe retainer assembly 20 is best seen in Figures 1, 8 and 10. There, toe retainer 20 is seen to be U-shaped in front elevation, with two arm portions 64 extending in the same direction away from an interconnecting bight portion 66. Bight portion 66 is provided on a ski engaging surface thereof having a slot or channel 68 (Fig. 8) which is adapted to house a strap portion 21 of the toe strap means 20. A buckle or snap 72 is also provided in order to enable the toe strap means 20 to be adjustably closeable over the toe portion of footwear with which the ski binding 10 is being used. The arm portions 64 are each provided on outwardly directed faces thereof having bosses 74 which are slotted as shown at 76 in Figure 1. It is therefore seen that the strap portion 21 is positioned in use intermediate the bight portion 66 and a ski to which the toe retainer assembly 20 is secured by the toe plate 18.

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It is noted that the toe plate 18 and apertures 32' in which the common screw fasteners 34 are received, are themselves normally brought into alignment by bosses 78 which are formed integrally of the bight portion 66. These bosses 78 are slightly elongated and are adapted to be received in correspondingly formed slots 80 provided in the aluminum toe plate 18. This aluminum toe plate retainer helps to minimize excessive wear of the bight portion 66, as would frequently be the case otherwise when using heavy soled shoes or overboots.

- 10 It will be apparent from the foregoing description that skis provided with the bindings 10 can be used for either cross-country or trail skiing with considerable ease. The present ski binding 10 provides flexibility for movement of the heel portion of a person's footwear to move reciprocally towards and from the ski, as occurs during the walking-like movements involved in trail skiing. The same binding 10, however, also provides adequate lateral rigidity to enable skiing down those small hills which might be encountered in cross-country skiing. This is an important feature since
- 20 mukluks normally are worn without shoes or other rigid support being provided for the heel. Thus, the heel cup 14 must provide the rigidity found in the heel or boot portion of heavy boots, and especially as usually provided by conventional ski boots. Climbing of hills using the "herring-bone" technique, or side-stepping would also be possible. The present ski binding 10 is therefore adaptable for different modes of skiing on a casual basis.

- The foregoing disclosure has set out one preferred embodiment of a ski binding envisaged by this invention. Some
- 30 alternative configurations have been suggested. It is intended within the spirit of this invention to encompass all such changes and modifications as would be apparent to those knowledgeable in this art, and which falls within the claims below.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A ski binding for receiving footwear worn by a skier; comprising;

an elongated resilient sole plate having upper and lower major surfaces, a forward portion and a rear portion, said forward portion only having means for connecting same to a ski;

a heel engaging cup attached to said sole plate at the rear portion thereof, said cup having spaced side walls and a rear wall for supporting the rear portion of the footwear of the skier, the heel engaging cup including strap receiving means for securing the heel cup to a skier's foot;

a toe retainer assembly attachable to the forward portion of the sole plate, the toe retainer assembly including a spaced apart pair of upright arms for embracing the toe portion of the footwear and being provided with apertures extending therethrough for receiving a toe strap means through said apertures to grip the toe portion of the footwear being worn by the skier;

and wherein said sole plate is sufficiently resilient as to enable the same to be flexed and the heel engaging cup to be swung upwardly and downwardly relative to said forward portion in an imaginary plane parallel to the longitudinal axis of the sole plate and normal to the major surfaces of the sole plate, said sole plate further providing for substantial rigidity of the heel engaging cup in a plane at right angles to the first mentioned imaginary plane to inhibit side-slip of said cup in a plane parallel to an upper surface of a ski when the binding is attached thereto.

2. The binding defined in claim 1, wherein the toe retainer assembly is generally U-shaped, each of said two

arms having bosses formed thereon with apertures extending through said bosses for receiving said toe strap.

3. The binding defined in claim 1 or 2, wherein said toe retainer assembly includes a transversely extending slot in a ski engaging surface thereof, said slot being configured to receive the toe strap means thereby to secure the toe portion of a skier's footwear firmly to said ski.

4. The binding defined in claim 1 or 2, wherein at least one of the toe retainer assembly, heel engaging means and sole plate are moulded from a polymeric material.

5. The binding defined in any one of claims 1 or 2, wherein each of the toe retainer assembly, the sole plate, and the heel engaging means is moulded of one of a polyethylene and nylon.

6. The ski binding according to claim 1 wherein lower portions of the side walls of the heel engaging cup are inclined outwardly to form a cross-sectionally enlarged bottom zone to receive the enlarged heel zone of the footwear.

7. The ski binding according to claim 1 or 6 wherein said strap receiving means in said heel engaging cup comprise slots arranged such that a strap threaded therethrough is disposed at an acute angle to said sole plate.

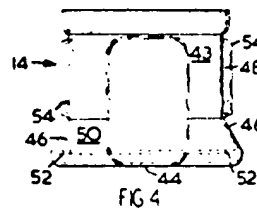
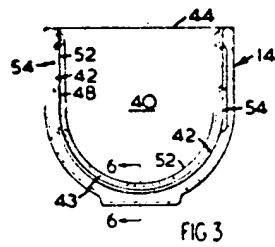
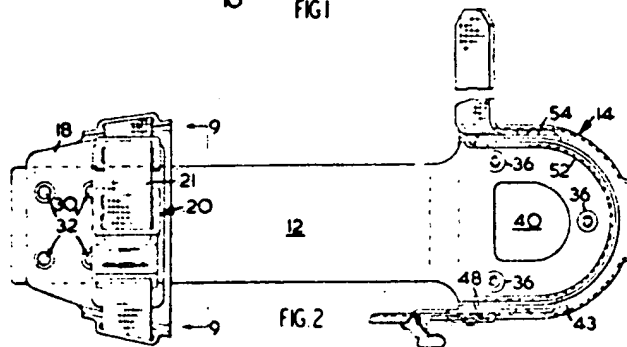
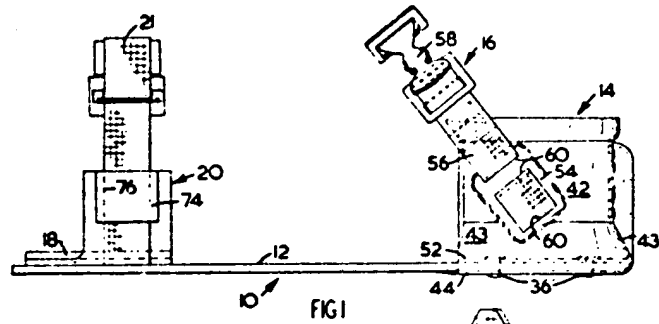
8. A ski binding according to claim 1 wherein said heel cup is of a one-piece construction with said side walls and rear wall being moulded integrally with one another from a polymeric material.

9. The ski binding according to claim 1 wherein said sole plate comprises a single generally flat strip of synthetic plastics material.

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10. The combination of a ski binding according to claim 1 and a ski, said sole plate being firmly secured at its forward portion only to an upper surface portion of the ski and said toe retainer assembly being firmly secured to the forward portion of the sole plate whereby to allow the sole plate to flex and the heel engaging cup to move upwardly and downwardly relative to the upper surface of the ski when in use.







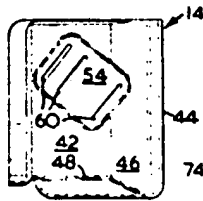


FIG. 5

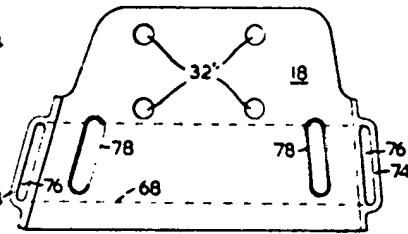


FIG. 7

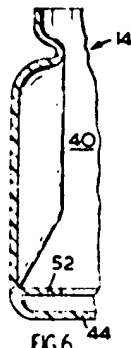


FIG. 6

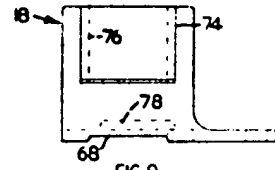


FIG. 8

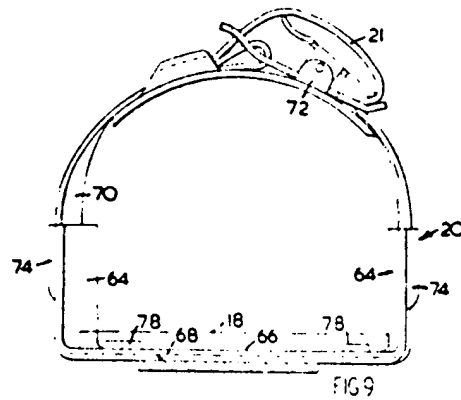


FIG. 9

